


Preliminary

TTP223-BA6
TTP223N-BA6
TonTouch™

1 KEY TOUCH PAD DETECTOR IC

GENERAL DESCRIPTION

The TTP223-BA6/TTP223N-BA6 TonTouch™ is a touch pad detector IC which offers 1 touch key. The touching detection IC is designed for replacing traditional direct button key with diverse pad size. Low power consumption and wide operating voltage are the contact key features for DC or AC application.

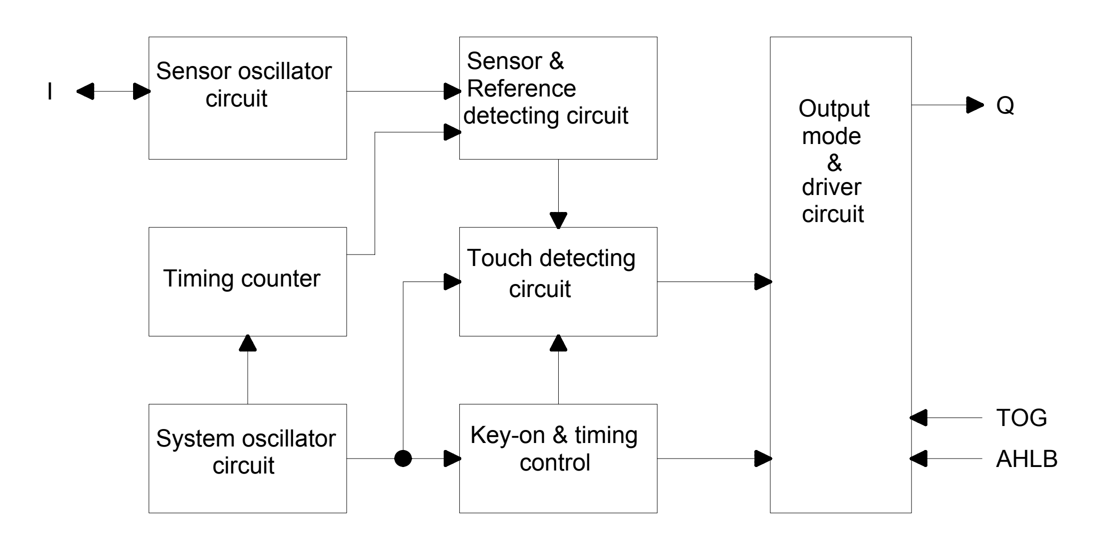
FEATURES

- Operating voltage 2.0V~5.5V
- Operating current @VDD=3V, no load
- At low power mode typical 1.5uA, maximum 3.0uA
- The response time max 220mS at low power mode @VDD=3V
- Sensitivity can adjust by the capacitance(0~50pF) outside
- Stable touching detection of human body for replacing traditional direct switch key
- Provides Low Power mode
- Provides direct mode 、toggle mode by pad option(TOG pin)
  Q pin is CMOS output
- All output modes can be selected active high or active low by pad option(AHLB pin)
- After power-on have about 0.5sec stable-time, during the time do not touch the key pad, And the function is disabled
- Auto calibration for life
  At low power mode the re-calibration period is about 4.0sec normally,
  When key detected touch and released touch, the auto re-calibration will be redoing after about 16sec from releasing key
- The sensitivity of TTP223N-BA6 is better than TTP223-BA6's.
  But the stability of TTP223N-BA6 is worse than TTP223-BA6's.

APPLICATION

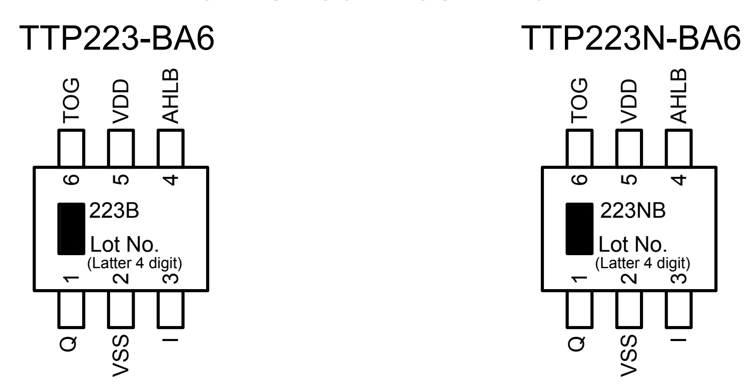
- Wide consumer products
- Button key replacement

BLOCK DIAGRAM



PACKAGE LIST

Package Type SOT-23-6L
TTP223-BA6 and TTP223N-BA6 PACKAGE CONFIGURATION



PAD DESCRIPTION

Pad No.	Pad Name	I/O Type	Pad Description
1	Q	O	CMOS output pin
2	VSS	P	Negative power supply, ground
3	I	I/O	Input sensor port
4	AHLB	I-PL	Output active high or low selection, 1=>Active low; 0(Default)=>Active high
5	VDD	P	Positive power supply
6	TOG	I-PL	Output type option pin, 1=>Toggle mode; 0(Default)=>Direct mode

Pin Type

I	CMOS input only
O	CMOS push-pull output
I/O	CMOS I/O
I-PL	CMOS input and pull-low resister
P	Power / Ground

ELECTRICAL CHARACTERISTICS

• Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Operating Temperature	T_{OP}	—	-40 ~ +85	℃
Storage Temperature	T_{STG}	—	-50 ~ +125	℃
Power Supply Voltage	VDD	Ta=25°C	VSS-0.3 ~ VSS+5.5	V
Input Voltage	V_{IN}	Ta=25°C	VSS-0.3 ~ VDD+0.3	V
Human Body Mode	ESD	—	4	KV
Note：VSS symbolizes for system ground				

• DC/AC Characteristics：(Test condition at room temperature=25℃)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Operating Voltage	VDD		2.0	3	5.5	V
System oscillator	F_{FAST}	VDD=3V	-	512K	-	Hz
	F_{LOW}			16K		
Sensor oscillator	F_{SEN}	VDD=3V no load	-	1M	-	Hz
Operating Current	I_{OP}	VDD=3V at low power mode and output no load	-	1.5	3.0	uA
Input Ports	V_{IL}	Input Low Voltage	0	-	0.2	VDD
Input Ports	V_{IH}	Input High Voltage	0.8	-	1.0	VDD
Output Port Sink Current	I_{OL}	VDD=3V, V_{OL}=0.6V	-	8	-	mA
Output Port Source Current	I_{OH}	VDD=3V, V_{OH}=2.4V	-	-4	-	mA
Output Response Time	T_R	VDD=3V, At fast mode			60	mS
		VDD=3V, At low power mode			220	
Input Pin Pull-low Resistor	R_{PL}	VDD=3V, (TOG, AHLB)		28K		ohm

FUNCTION DESCRIPTION

1. Sensitivity adjustment

The total loading of electrode size and capacitance of connecting line on PCB can affect the sensitivity. So the sensitivity adjustment must according to the practical application on PCB. The TTP223-BA6/TTP223N-BA6 offers some methods for adjusting the sensitivity outside.

1-1 by the electrode size

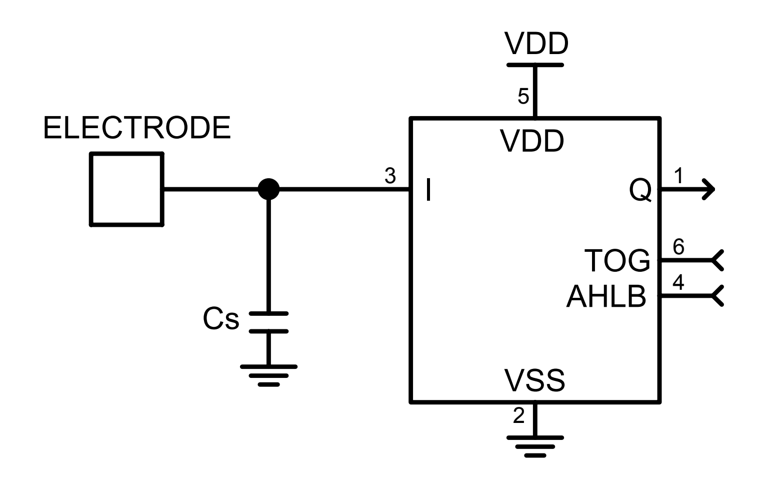
Under other conditions are fixed. Using a larger electrode size can increase sensitivity. Otherwise it can decrease sensitivity. But the electrode size must use in the effective scope.

1-2 by the panel thickness

Under other conditions are fixed. Using a thinner panel can increase sensitivity. Otherwise it can decrease sensitivity. But the panel thickness must be below the maximum value.

1-3 by the value of Cs (please see the down figure)

Under other conditions are fixed. When do not use the Cs to VSS, the sensitivity is most sensitive. When adding the values of Cs will reduce sensitivity in the useful range ($0 \leqq Cs \leqq 50pF$).



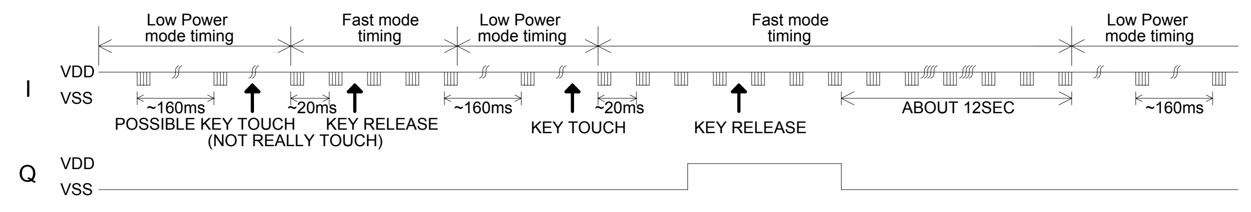
2. Output mode

The TTP223-BA6/TTP223N-BA6 has direct mode active high or low by AHLB pad option. And has toggle mode by TOG pad option. Pad Q is CMOS output.

TOG	AHLB	Pad Q option features
0	0	Direct mode, CMOS active high output
0	1	Direct mode, CMOS active low output
1	0	Toggle mode, Power on state=0
1	1	Toggle mode, Power on state=1

3. Low power mode

The TTP223-BA6/TTP223N-BA6 is Low Power mode. It will be saving power. When detecting key touch, it will switch to Fast mode. Until the key touch is released and will keep a time about 12sec. Then it returns to Low Power mode.
The states and timing please see below figure.



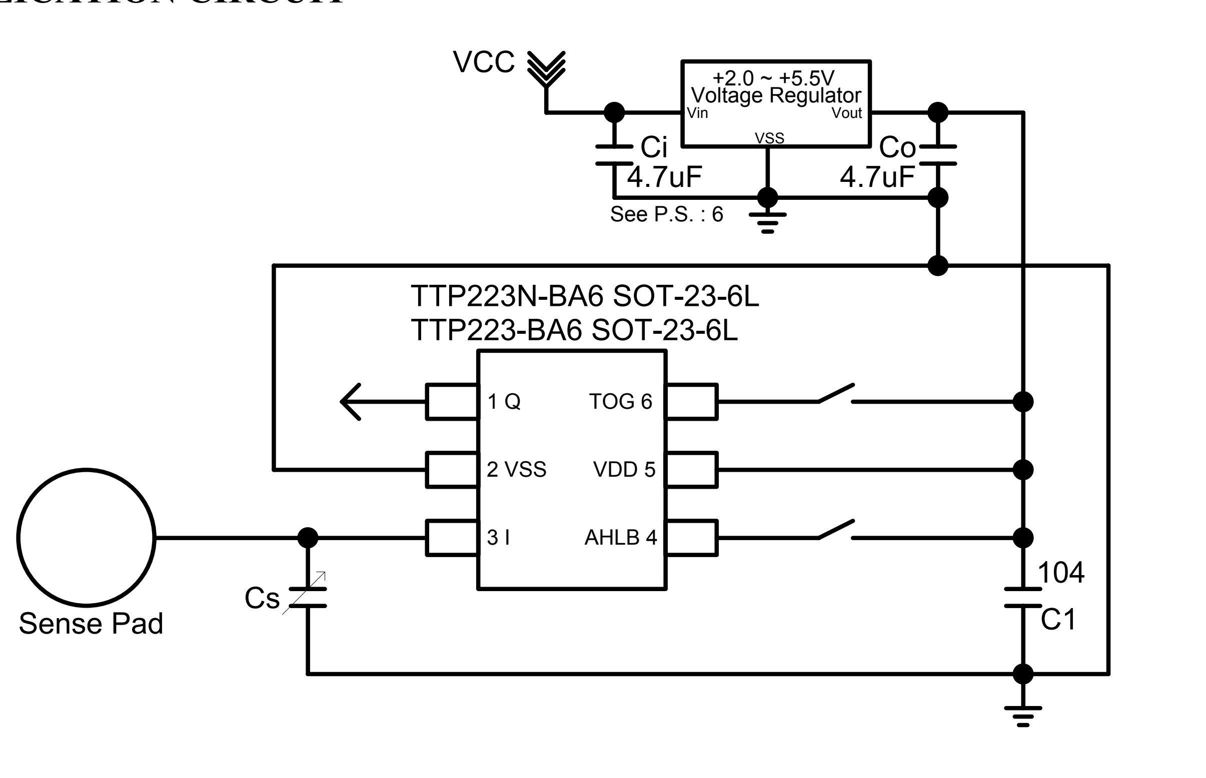
Low Power Mode

4. Option pin

For power saving concern and package bonding option consideration, all the feature option pins with latch type design and initial states are 0 or 1 as power on. If those pins are forced to VDD or VSS, the states will be changed to 1 or 0 without any current leakage to conflict the power saving issue.

Feature option pins	Initial state by Power on
AHLB	0
TOG	0

APPLICATION CIRCUIT

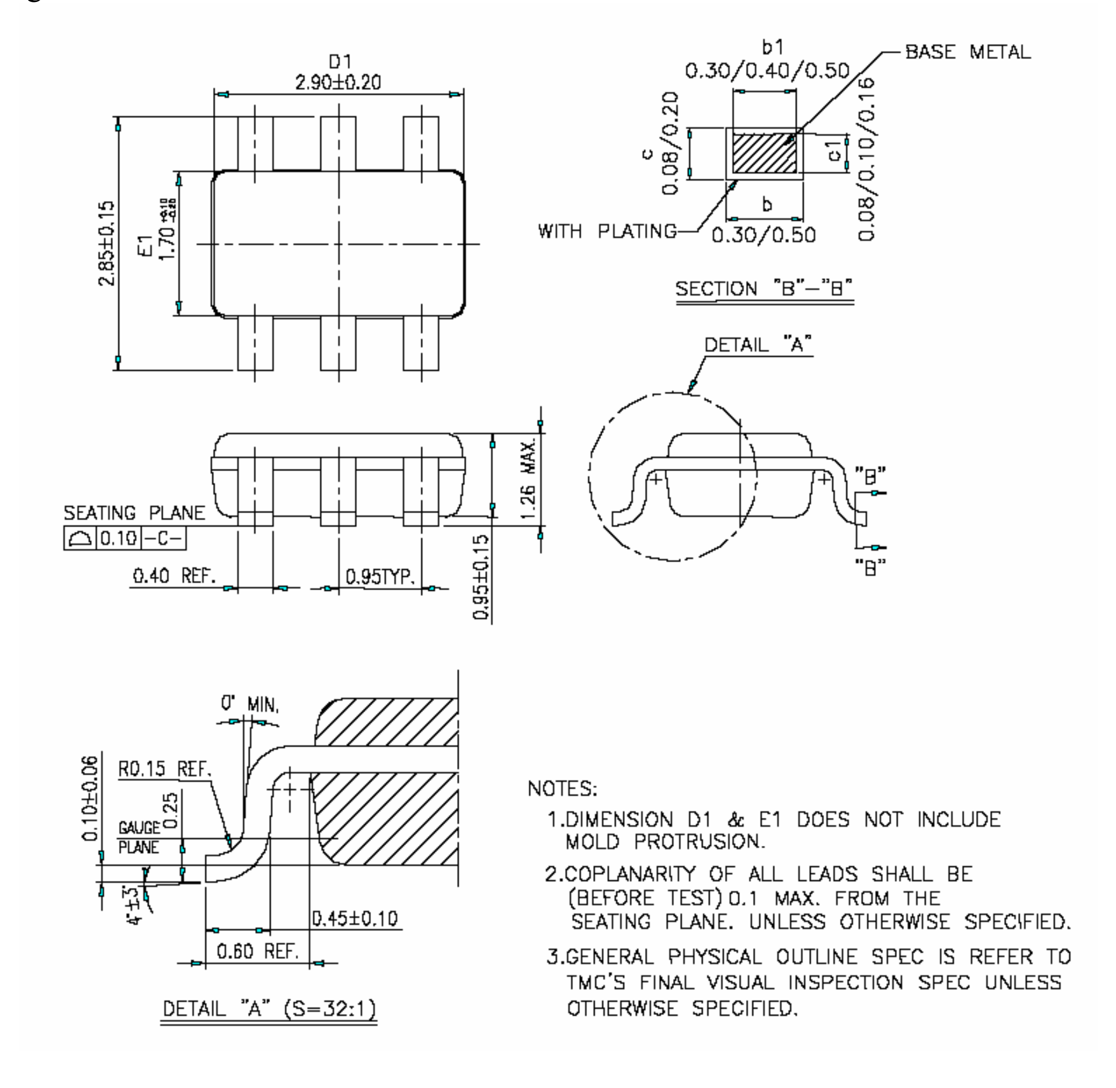


PS：1. On PCB, the length of lines from touch pad to IC pin shorter is better. And the lines do not parallel and cross with other lines.

2. The power supply must be stable. If the supply voltage drift or shift quickly, maybe causing sensitivity anomalies or false detections.
3. The material of panel covering on the PCB can not include the metal or the electric element. The paints on the surfaces are the same.
4. The capacitance Cs can be used to adjust the sensitivity. The value of Cs use smaller, then the sensitivity will be better. The sensitivity adjustment must according to the practical application on PCB. The range of Cs value is 0~50pF.
5. The C1 capacitor must be used between VDD and VSS; and should be routed with very short tracks to the device's VDD and VSS pins (TTP223-BA6/TTP223N-BA6).
6. The value of capacitors can be used by the real application for Ci and Co capacitors.
7. The sensitivity adjustment capacitors (Cs) must use smaller temperature coefficient and more stable capacitors. Such are X7R, NPO for example. So for touch application, recommend to use NPO capacitor, for reducing that the temperature varies to affect sensitivity.

Package Type: SOT-23-6L

Package Outline Dimension



ORDER INFORMATION

a. Package form: TTP223-BA6、TTP223N-BA6

REVISE HISTORY

1. 2008/08/15
 -Original version：V1.0
2. 2009/08/31 => V_2.0
 -Add the TTP223N-BA6.
 -Add the trademark 〝TonTouch™〞 to every page.
3. 2009/11/30 => V_2.1
 - On the page-3 change the Operating Temperature => -40 ~ +85℃.